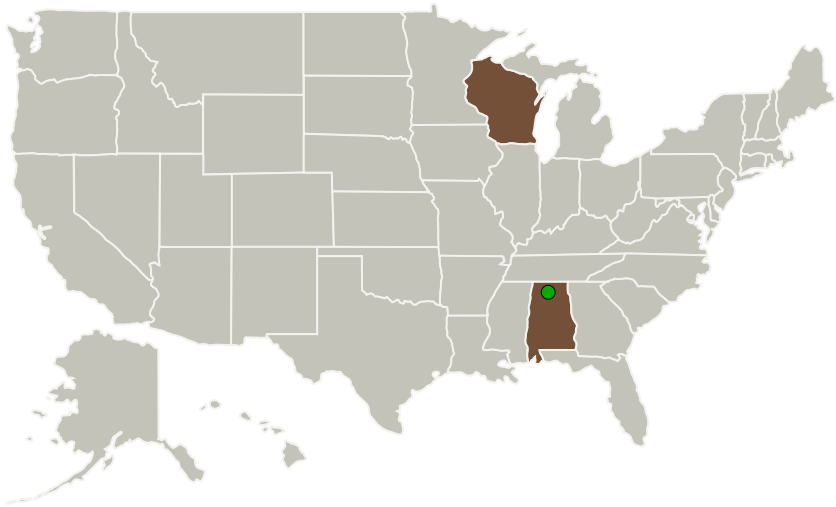
Rapid Multiplex Microbial Detector, Phase I

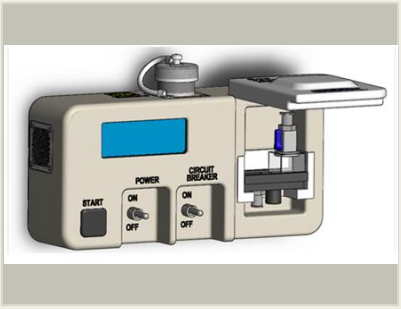
Completed Technology Project (2013 - 2013)

Project Introduction

ORBITEC, in collaboration with Lucigen, proposes a rapid nucleic acid-based detector for spaceflight water systems to enable simultaneous quantification of multiple waterborne pathogens with minimal consumables and crew time. The Rapid Multiplex Microbial Detector (RMMD) amplifies the genetic material in a liquid sample to allow near real-time identification of specific genetic sequences of predetermined bacteria and fungi. This easy-to-use device incorporates a patented polymerase enzyme that enables rapid RNA amplification by reagents with superior long-term shelf life and thermal stability. To operate, a water sample is injected into the RMMD, where it is concentrated and mixed with the reagent. The RMMD is rapidly heated and maintained at an elevated temperature for approximately 15 minutes, then quickly cooled back to room temperature to amplify the genetic material in the sample, which is detected in real time by changes in fluorescence due to dye binding, thus providing quantification. pathogenic cells in the water sample can be rapidly detected quantitatively based on the time of development of fluorescence. Phase 1 activity will result in prototype hardware and software genetic amplification and detection of several pathogenic bacteria and fungi that will bring the technology to TRL 5. The anticipated results of the Phase 2 are an engineering development unit that consists of an amplification/detection process controller, sample cartridges, and reagents, that can be tested in space.

Primary U.S. Work Locations and Key Partners





Rapid Multiplex Microbial Detector

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Organizations Performing Work	Role	Type	Location
Sierra Nevada Corporation(SNC)	Lead Organization	Industry Women-Owned Small Business (WOSB)	Sparks, Nevada
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama
Orbital Technologies Corporation	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Madison, Wisconsin

Primary U.S. Work Locations	
Alabama	Wisconsin

Project Transitions

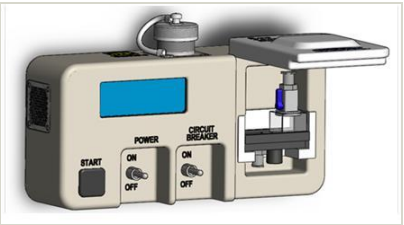
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138446)*

Images



Project Image
Rapid Multiplex Microbial Detector *(https://techport.nasa.gov/image/135224)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Sierra Nevada Corporation (SNC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Ross Remiker

Co-Investigator:

Ross Remiker

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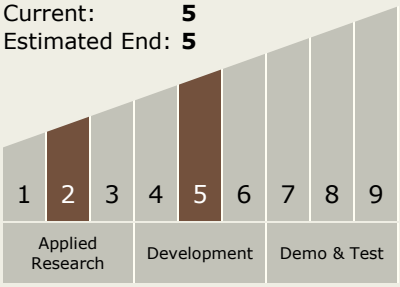
Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.4 Environmental Monitoring, Safety, and Emergency Response
    - TX06.4.1 Sensors: Air, Water, Microbial, and Acoustic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System